We are pleased not only that our contemporary should bear such hearty testimony to the energy and success of Dr. Appleton, in promoting the cause which he had at heart, but that it should be able to refer to the subject of endowment of research not only without bitterness, but with even some slight measure of approval. A cause which had so pure-minded, clear-sighted, and widely-cultured a man as Dr. Appleton on its side, must surely have some solid reasons in its favour.

Dr. Appleton is acknowledged by all who knew him to have been one of the most even-tempered of men. He was always cheerful and complaisant; opposition and even rudeness did not ruffle him; he returned to the charge smiling at every blow. He was a very quick and ready manager in such work as that of an editor, being full of suggestion, and prompt at meeting difficulties. He was a genuine philosopher, though he professed keen interest in all departments of knowledge, he did not make the mistake of over-estimating his own knowledge, or of pretending to an encyclopædiac mind. His great merit is that he really gave time and strength for "ideal" ends.

PRISON BREAD

IN two former papers[1] I discussed the dietetic value and chemical composition of brown bread and of aerated bread. The recent report[2] of the Committee appointed to inquire into the dietaries of the prisons in England and Wales having called public attention to the subject of the nourishment contained in different varieties of bread, the suggestions made in that report may be suitably considered at the present time.

On pages 21, 22, 23, 38, and 39 of the report will be found the statements and figures as to the bread question, which I propose to criticise on the present occasion. The committee begin by stating that "the flesh-formers in white bread amount to 7 or 8 per cent., according to the quality of the wheat of which it is made. In bread containing the envelopes (of the grain) they amount to about 10 per cent." Two or three years ago little fault could have been found with these statements; indeed, the Committee appear here as in other parts of their report, to have drawn some of their facts and figures from a work of my own on Food, published in 1876 for the Science and Art Department. Still I am not now prepared, in the light of the most recent analyses of wheat and its mill-products, to endorse the statement that brown bread, whether made so as to include all the flour, middlings, sharps, pollard, and bran, produced from a given weight of wheat, or with all these materials minus the coarse bran, will contain on the average 10 per cent. of flesh-formers. Why, there are some varieties of wheat, beautiful, plump, soft, white, floury wheats, which do not contain more than 8 per cent. of total nitrogenous matters of all kinds, including veritable flesh-formers. How then can a wheat of this kind, if simply ground up (whether the 4 per cent. of long bran it yields be included in or excluded from the bread), be made to yield a brown bread or whole meal bread containing more flesh-forming matter than $5\frac{1}{2}$ per cent.? For the meal will have taken up nearly one half its own weight of additional water, and will now be proportionately more dilute as to all its nutrients.

And, again, I have previously pointed out that the coverings of the wheat grain contain, in varying, yet considerable proportions, nitrogenous compounds to which the flesh-forming property cannot be rightly attributed. Thus, it may easily happen that the inclusion of the 14 or 15 per cent. of mill products, usually rejected in bread-making (excluding the long bran), may not appreciably influence the proportion of flesh-formers in the loaf. These two considerations do not, in my opinion, lessen the desirability of substituting whole meal bread for white bread in our prisons, but they invalidate some of the Committee's calculations as to the amounts of flesh-formers supplied in the new prison-dietaries, and they further suggest a method of adjusting the nutrient ratio which should subsist between the nitrogenous and carbonaceous constituents of the day's ration. I will briefly discuss these two points.

We are told (on page 38) that 7 lbs. per week of bread will furnish the prisoner with 9·072 ounces of flesh-formers. Now, if the bread referred to be that recommended by the reporters, 7 lbs. should furnish, according to their own showing, no less than 11·2 ounces of flesh-forming nitrogenous matters. For they affirm such bread to contain on the average 10 per cent. of flesh-formers, and so the weekly allowance of 7 lbs. or 112 ounces of bread would furnish 11·2 ounces of these nutrients. They appear, however, to have assumed the bread in use to contain not 10, but only 8·1 per cent. of flesh-formers—at least, in the absence of direct analytical data, I deduce this figure from the calculated amounts of nitrogenous substance tabulated in the report. Indeed, I conclude that they have not made the fresh calculations rendered necessary by the altered composition of the proposed bread, but have adopted the old figures of Playfair and other writers on this subject. But taking average whole meal bread made as directed by the reporters, and from ordinary wheats, it would not be safe to reckon upon it containing as much as 8·1 per cent. of true flesh-forming material—my own experiments put it at a little above 7. But granted the higher figure, we then find that the prisoners with hard labour (with 7 days' confinement) receive no more than 14 ounces of flesh-formers to 96 of heat givers, reckoned as starch, during a week. The ratio here is 1 to 6·8, which differs too widely from the normal ratio ($1 : 4\frac{1}{2}$) to afford satisfactory sustenance to men expected to do hard work.

There are, however, two ways out of this difficulty. Why should not a part of the fine flour be excluded from the constituents of the meal for prison bread? Or again, why should not biscuit flour, tailings, and middlings be added to it from other sources? And the same result might be ensured, and the flesh-formers be at the same time more adequately represented in the bread, if care were taken to choose for prison meal the hard, horny and tail wheats, which are always more nitrogenous than the white, opaque and soft grains. It is true that some of these hard, translucent wheats, especially when they owe their character to unripeness or a wet season, contain a larger proportion than usual of non-albuminoid nitrogen, but in spite of this their percentage of true flesh-formers is always high. It would be quite easy, by chemical analysis of the samples of grain offered by contract to the authorities, always to secure a wheat containing 13 to 14 per cent. of true flesh-formers, and therefore capable of producing a bread with at least 9 per cent.

There are two other remarks suggested by reading the part of this report on Prison Dietaries which relates to bread. The Committee is clearly right when it urges the desirability of including most of the coarser mill products of wheat in the meal on account of the phosphates thus secured. And the proposed plan is a good one, of making the dough of the finer mill products only at first, and then introducing, when the dough is nearly ready for the oven, the middlings, sharps, and pollard; again, kneading the mass as quickly as possible, and then baking it. The excessive solidity and stickiness of most whole meal bread is thus avoided, since the ferments present in the seed coats of the grain have but little time to exert their action upon the starch of the flour. A. H. CHURCH

[1] NATURE, vol. xviii. p. 229, and vol. xix. p. 174.
[2] Report of Committee on Dietaries in Prisons, 1878.

ISOMORPHISM

AT the regular meeting of the Berlin Chemical Society on February 10, Prof. Hermann Kopp, of Heidelberg, delivered an address upon "Isomorphism." Prof.

Kopp first proceeded to sketch the methods employed for determining the molecular and atomic weights of the elements. When an element can be volatilised conveniently, so that we can obtain its vapour-density, its molecular weight is readily decided. Those elements which enter with a large number of volatile, or gaseous bodies, like carbon, present but little difficulty. Those, like zinc, which form but one class of volatile compounds, leave much to be desired, for a series of homologous bodies are no better than a single member of the series. In this case, however, the specific heat of the element comes to our aid, and we can usually take such a multiple of its equivalent as will give, when multiplied by the specific heat, a product not far from six. Naumann's law also enables us to make use of the specific heat of salts as well as that of the elements, the product of the specific heat by the sum of the atomic weights being nearly equal for similar compounds, and usually six times that of the number of atoms in a molecule. But this fails in some cases, probably, because we cannot take the specific heat at a sufficiently high temperature, as in the case of ice. In many cases where the above tests fail, isomorphism holds good. But totally unlike bodies, containing an unlike number of atoms in the molecule, have the same crystalline form. To avoid this dilemma, Prof. Kopp proposes to limit the term isomorphous to those compounds which possess the same crystal-forming power, as proved by their ability to crystallise together, or, if unequal in solubility, the ability of one crystal to grow in a solution of the other. Both of these cases were beautifully illustrated by alums. If a trace of a chromalum solution be added to a solution of potash-alum, each crystal that forms will contain both, as shown by the reddish tinge, and the colour deepens as the quantity of chromalum added is increased. On the other hand, when a crystal of one sort of alum is placed in a solution of the other kind, it continues to grow. Fine specimens of such crystals were exhibited by the speaker, who is remarkably skilful in this matter of growing and nursing crystals. Many other isomorphous salts were exhibited, such as the sulphates of magnesia and nickel; in some cases two different salts had been deposited alternately over the crystal of a third salt. Most interesting were rhombohedra of calxspar covered with nitrate of sodium, thus proving these two bodies isomorphous. The professor acknowledged that he had had much difficulty in obtaining these, and had utterly failed to make a crystal of arragonite grow in a solution of nitrate of potash. Prof. Kopp said, in conclusion, that unlike number of atoms could not replace each other in a molecule of two isomorphous bodies. Sulphate of cadmium will crystallise with eight equivalents of water to three of the anhydrous salt. Sulphate of didymium crystallises with eight equivalents of water. Both have the same crystalline form, but two atoms of didymium seem to replace the three of cadmium:—

$$Di_2S_3O_{12} + 8H_2O;$$
$$Cd_3S_3O_{12} + 8H_2O.$$

But these salts will not crystallise together, and crystals of the latter, from a mixed solution, contain no pinkish tinge of didymium.

HER MAJESTY'S ASTRONOMER AT THE CAPE

MR. DAVID GILL has been gazetted successor to Mr. E. J. Stone in the direction of the Royal Observatory, Cape of Good Hope. The discrimination exercised by the First Lord of the Admiralty in this appointment, we are confident will be appreciated and applauded by astronomers generally. Obtaining his first experience in practical astronomy in the Observatory at Aberdeen, and in a private observatory which he erected in the same place, Mr. Gill was so fortunate as to be associated with Lord Lindsay in the designs and details of the large observatory founded by this nobleman at Dun Echt in 1870, taking the position of chief of the staff. He thus became engaged in the organisation of the expedition to the Mauritius fitted out by Lord Lindsay for the observation of the transit of Venus, on which occasion advantage was taken of the circumstance of a heliometer forming part of the equipment to determine the sun's distance by measures of the planet Juno, being the first trial of the method, and attended with satisfactory results; the details of this work were published by Lord Lindsay as the joint work of himself and Mr. Gill. In connection with the same expedition, Mr. Gill arranged and personally conducted the whole of the chronometric and telegraphic longitude determinations connecting Berlin, Malta, Alexandria, Suez, Aden, Bombay, Seychelles, Reunion, Mauritius, and Rodriguez. It was while engaged upon these operations that he undertook, at the request of the Khedive, the measurement of the first base line of the geodetic survey of Egypt. In 1877 Mr. Gill laid before the Royal Astronomical Society a proposal to determine the sun's distance by heliometric observations of the planet Mars about the very favourable opposition of that year, Lord Lindsay lending his heliometer for the purpose. The proposal met with the support of the Astronomer-Royal and Council of this Society, and was further aided in its execution by a grant from the government funds in the hands of the Royal Society. The Island of Ascension was fixed upon as a favourable station for these observations, and Mr. Gill proceeded to Ascension in June, being occupied there about six months in the necessary preparations and carrying out of the scheme. The reductions are still proceeding, but in proof of the importance attached to this attempt to obtain a reliable value of the solar parallax and the interest felt by the leading astronomers of different nations in his work, it may be mentioned that on asking for aid in the accurate determination of the positions of the stars observed with Mars, his request was cordially acceded to at the following observatories:—Greenwich, Oxford, and Liverpool, Albany, U.S., Berlin, Cambridge, Mass., Cordoba (the national establishment of the Argentine Republic), Königsberg, Leipsic, Leyden, Melbourne, Paris, Pulkova (the Imperial Observatory of Russia), and Washington.

We will express the hope that Mr. Gill may carry to his new sphere a continuance of the great energy he has hitherto shown and repeat our conviction that his nomination by the First Lord to the important position of "Her Majesty's Astronomer at the Cape," will be hailed with great satisfaction in the astronomical world. It is understood that Mr. Gill leaves England early in May, arriving at the Cape in good time to confer with Mr. Stone upon the future work of the Observatory.

OUR ASTRONOMICAL COLUMN

THE NAVAL OBSERVATORY, WASHINGTON.—The Report of Admiral Rodgers, superintendent of this great astronomical establishment, for the year 1878 has just been issued. The operations of the institution have been more than usually extended, involving expeditions for the observation of the transit of Mercury on May 8, and the total solar eclipse of July 29. The 26-inch refractor has been in charge of Prof. Asaph Hall, with Prof. Holden as assistant, and has been constantly employed in the observation of satellites, double stars, and nebulæ, and occasionally of comets. Admiral Rodgers mentions that many foreign astronomers visiting the United States on the occasion of the eclipse, took the opportunity of inspecting this instrument, expressing very generally an opinion that the mounting was too light, and in this opinion the superintendent to a certain degree coincides,